ACHREF DOULA

Postdoctoral Researcher in Reliable Machine Learning

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Research Profile

Postdoctoral researcher developing theoretically grounded methods for the reliability of machine learning systems. My research makes uncertainty guarantees *portable*: I study when and how uncertainty measures can be transferred across domains, input spaces, and latent representations, and, through the lens of algorithmic game theory, how uncertainty shapes the outcome of interactions between agents, human or machine. This agenda builds on a PhD (**summa cum laude**, TU Darmstadt, 2025) on uncertainty-aware perception, prediction, and planning in safety-critical systems. Author of 13+ peer-reviewed publications at ICML, CoRL, IROS, ICRA. Holder of a competitively awarded Software Campus research grant (BMBF, EUR 100K). Recipient of the **ICML 2026 Gold Reviewer Award**.

Education

PhD in Computer Science (Dr. rer. nat.), Summa Cum Laude 2020 – 2025
Technical University of Darmstadt | Germany
Dissertation: On Uncertainty-Aware Perception, Prediction, and Planning.
Supervisor: Prof. Max Mühlhäuser.

M.Sc. in Electrical Engineering and Information Technology 2016 – 2020
Technical University of Darmstadt | Germany
Thesis: Deep Active Learning for Semantic Segmentation.
Supervisors: Prof. Heinz Köppl and Prof. Max Mühlhäuser.

Dipl.-Ing. in Electrical Engineering 2010 – 2015
National Engineering School of Tunis (ENIT) | Tunisia
Ranked in the top 5% nationwide in the national competitive examination for engineering studies.

Academic Appointments

Postdoctoral Researcher 2025 – Present
Telecooperation Lab, Technical University of Darmstadt | Darmstadt, Germany

- Lead research on calibration and uncertainty quantification under distribution shift, with current work on representation-level transfer and strategic uses of uncertainty.
- Developed **Transported Conformal Calibration** (ICML 2026, single author), transferring labeled source calibration to a target input space through unlabeled paired observations and an observable certificate of residual mismatch.
- Co-developed a principled account of uncertainty as a decision signal in human–AI interaction (ICML 2026), studying when an AI system should act, defer, or request additional input.
- Supervise Master's students, mentor junior researchers, and coordinate collaborative research and publications.

Visiting Postdoctoral Researcher Jul 2025 – Present
Tongji University | Shanghai, China

- Conduct interdisciplinary research on reliable machine learning and uncertainty-aware multi-agent systems in collaboration with the College of Architecture and Urban Planning.

Doctoral Researcher Jul 2020 – 2025
Telecooperation Lab, Technical University of Darmstadt | Darmstadt, Germany

- Developed uncertainty-aware methods for perception, prediction, planning, and human interaction in safety-critical autonomous systems.
- Introduced **Knowledge-Refined Prediction Sets** (CoRL 2024), combining conformal prediction with symbolic constraints; reduced prediction-set uncertainty by up to 80% and improved semantic consistency by 30%.
- Developed neuro-symbolic forecasting (NeSyMoF, IROS 2024) and conformal LLM-based navigation (SafePath, 2025); supervised Bachelor's and Master's theses.

Research Funding and Selected Honors

- **ICML 2026 Gold Reviewer Award.** Recognized among the conference's top reviewers.
- **Software Campus Fellowship and Research Grant, BMBF (EUR 100K), 2022 – 2025.** Project lead for SemUrban; responsible for the research agenda, budget, milestones, stakeholder coordination, and transfer activities.
- **PhD awarded Summa Cum Laude, 2025.** Highest doctoral distinction at the Technical University of Darmstadt.
- **Top 5% nationwide.** Tunisian national competitive exam for engineering studies.

Selected Publications

Selected publications in reverse chronological order. Complete list: Google Scholar.

[1] **Conformal Calibration Transfer.** **A. Doula**. *ICML 2026.*

[2] **Position: Uncertainty is a Strategic Signal in Human–AI Decision Making.** **A. Doula**, O. Herzog, S. Z. Wu, and M. Mühlhäuser. *ICML 2026.*

[3] **SafePath: Conformal Prediction for Safe LLM-Based Autonomous Navigation.** **A. Doula**, M. Mühlhäuser, and A. Sanchez Guinea. *arXiv preprint, 2025.*

[4] **Conformal Prediction for Semantically-Aware Autonomous Perception in Urban Environments.** **A. Doula**, T. Güdelhöfer, M. Mühlhäuser, and A. Sanchez Guinea. *CoRL 2024.*

[5] **NeSyMoF: A Neuro-Symbolic Model for Motion Forecasting.** **A. Doula**, H. Yin, M. Mühlhäuser, and A. Sanchez Guinea. *IROS 2024.*

[6] **AR-CP: Uncertainty-Aware Perception in Adverse Conditions with Conformal Prediction and Augmented Reality for Assisted Driving.** **A. Doula**, M. Mühlhäuser, and A. Sanchez Guinea. *CVPR Workshops 2024.*

[7] **PointCloudLab: An Environment for 3D Point Cloud Annotation with Adapted Visual Aids and Levels of Immersion.** **A. Doula** et al. *ICRA 2023.*

Research Supervision and Teaching

- Supervised 10+ Bachelor's and Master's theses to completion in conformal prediction, uncertainty quantification, neuro-symbolic learning, LLM-based systems, and Human-AI interaction (2020 – present).
- Course: Distributed Algorithms (winter term 2020, 2021, 2022, 2023)
- Course: Ubiquitous Computing- Machine Learning (summer term 2021, 2022, 2023)

Academic Service

- **Conference and journal reviewer:** TMLR, ICML (2026), KDD (2026), NeurIPS (2025, 2026), ICCV (2025), NAACL (2025), ICRA (2023), CHI (2025), and IEEE Robotics and Automation Letters.

Earlier Industry Research Experience

Working Student, Deep Learning, *Merck KGaA, Big Data and Advanced Analytics* May 2019 – Jun 2020
Research on pharmaceutical knowledge graphs for drug discovery and molecular-property prediction.

Working Student, Deep Learning, *IFCC GmbH* Oct 2018 – Apr 2019
Deep-learning models for product classification and anomaly detection in industrial data.

Research Methods and Technical Tools

Research methods: Conformal prediction, uncertainty quantification, calibration under distribution shift, representation transfer, neuro-symbolic learning, strategic AI interaction, and multi-agent learning.

Technical tools: Python, PyTorch, C++, MATLAB, Docker, Git, and Linux.

Languages: Arabic (native), French (native), English (C1), German (C1), Italian (A2).